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ACHIEVING INFORMATION SUPERIORITY: PUTTING CLOTHES ON THE EMPEROR

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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Reality-based transformation and innovation can occur if we keep certain touchstones in mind. First, we need to make sure we communicate within a mutually understood frame of reference. Doctrine does that for us by defining common terms and concepts. Second, even revolutionary change starts from where we stand. We can achieve successful leaps in capability as long as we are sure we do not assume away needed solutions to hard problems. An evaluation of our current capabilities shows us the toughest problem we face right now is our ability to transform data into battlefield understanding. Third, we need to test and quantify our progress in order to make sure our assumptions are still correct. The military has long used exercises accomplish this mission. We have the capability to apply this same tool to this challenge.

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Introduction

Information Superiority is a critical enabler for Joint Vision 2010's Operational Concepts. It is a prerequisite for the success of the entire vision; so it is not surprising that we make grand predictions of a future information Nirvana. Unfortunately, there are not very many concrete assessments that quantify where we are today and what it will take to achieve the information dominance we need to succeed. This paper proposes that if we analyze the components of Information Superiority in doctrinal terms, we find one current, critical weakness that needs our attention. That weakness is our capacity to transform data into battlespace understanding. This paper also suggests an exercise strategy that could help quantify and correct this weakness.

Compelling Vision

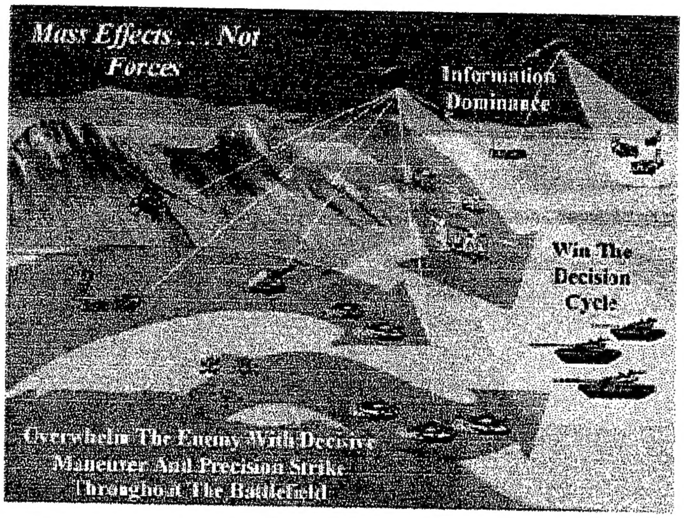

Figure 1: The Vision

Few military professionals question the value of Joint Vision 2010's Operational Concepts. After all, what warfighter would not be compelled by a battlespace where we dominate maneuver, focus logistics, precisely mass firepower effects, and protect our forces? However, even a compelling vision loses disciples if it requires an unrealistic leap of faith to believe it is achievable. We have all seen the futurists' Power Point slides with lightening bolts flashing among satellites, UAVs, and command posts. The lightning flashes to tanks, ships, and aircraft launching arrows to hapless enemy target sets (Figure 1). The pictures look good but many of us ask, "Are these futurists credible or are they

like the fabled weavers who sold the Emperor invisible clothes?" We can answer this question when we move beyond generic prognostications, and specifically define tasks, identify critical weaknesses, and deliver concrete solutions. If JV 2010 is to ever have substance, we need to establish measures of effectiveness for its key enabler, Information Superiority.

Information Superiority is defined as: "the ability to collect, process, and disseminate an uninterrupted flow of information while exploiting and/or denying an adversary's ability to do the same.[1] This paper focuses on the first two elements of Information Superiority - collection and processing of information. In addition to being critical tasks of Information Superiority, collection and processing are probably the most dynamic and unpredictable elements of the future battlespace. Moore's Law predicts information processing speed will increase twofold every 18 months.[2] Some authors expect this trend to continue for 20 years. [3]

With such exponential changes, many military strategists predict information technology will not only be an enabler for JV 2010, but it will also be the basis for the next Revolution in Military Affairs. Some futurists believe this revolution is so radical that we need to abandon current thinking and commit to new, innovative paradigms. But if the information technology revolution is so far beyond our comprehension, why do the prognosticators still quote Sun Tzu's "Know your enemy, Know yourself. . ." advice from a few thousand years ago? The reason they quote this ancient sage is because certain factors of human interaction do not change. There are enduring human touchstones that define the parameters that change. Successful revolutions are bound and directed by enduring concepts.

I grant that the long term results of the information explosion are almost incomprehensible, but the answer to exploiting even this revolutionary change can be accomplished through current doctrine, capabilities, and exercises. Our current doctrine

provides a model that defines echelons of a "Cognitive Hierarchy".[4] [5] It is a solid concept that credibly describes the way humans deal with information. Rather than invent a new model, we can use doctrine as a common frame of reference to direct our efforts. Our current capabilities provide clues as to our critical weaknesses in handling the exponential change in the information environment. We need to understand the processes that limit us today in order to shape tomorrow's requirements. Our current exercises have the potential to quantify this weakness and help direct energy to specific technological, organizational, or procedural solutions.

Doctrine Provides a Model

We are bound by language. Language can limit or expand understanding of our environment. An indication of a dominant element in a civilization's environment is the number of words it uses to describe that one element. That is why Eskimos have scores of words to describe snow. One word simply cannot handle the vast connotations and denotations for an element that dominates their world.

The information technology explosion endangers our vocabulary's ability to handle the many connotations and denotations of the word "information" in today's society. Unfortunately, in many think pieces and prognostications about Information Superiority, we sloppily use the word "information" to describe a vast array of elements in that environment. In order to understand each other, our dialogue about Information Superiority demands that we be precise about what aspect of "information" we are talking about.

Without inventing a new language, we have a construct we can use. Our doctrinal publications contain a model that allows us that precision. Precise use of doctrinal language is necessary for us to define where we are and helps prioritize where we need to direct our effort.

Joint Pub 6-0, Doctrine for Command, Control, Communications, and Computer (C4) Systems Support to Joint Operations[6] and U.S. Army Field Manual 100-6, Information Operations [7] describe a Cognitive Hierarchy (Figure 2). This hierarchy gives us two important insights. First, it defines doctrinal terms that allow us to communicate precisely. Second, it shows that the mere accumulation of data does not result in understanding. We must take an action to move from one level of the hierarchy to another.

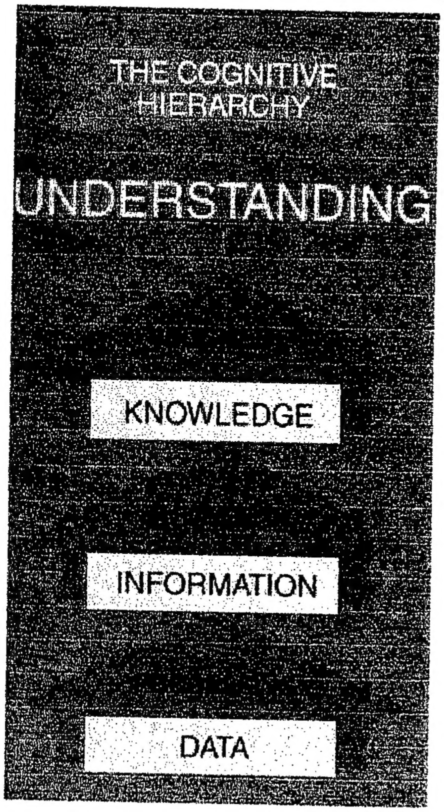

Figure 2: The Cognitive Hierarchy

As we attack Information Superiority and related battlespace enablers such as Information Operations and Network Centric Warfare, we need to articulate where on the Cognitive Hierarchy we are working. Critical reading of many futuristic visions of information webs, networked sensors, and infospheres uncovers that much of the discussion deals with the collection and distribution of data. There is relatively little discussion of the capabilities needed to transform that data into understanding. The transformation of data into information, knowledge, and understanding is similar to the transformation of a raw material into various qualities of products. There is a relationship between an investment of energy and the quality of the product. A tailor, working with cloth, increases the value of the material as he designs finer and finer suits. For those of us who work with information we need understand the relationship between processing and quality. Doctrine, again, provides us a framework.

The measures of information quality are spelled out in the seven Information Quality Criteria in Joint Pub 6-0 (Figure 3). [8] Alberts, Gartzka, and Stein identify three of these seven criteria -- relevancy, accuracy, and timeliness -- as the three dimensions that measure information superiority.[9] By combining these measures of information quality with the concept of a Cognitive Hierarchy, we construct a doctrinal, frame of reference and specify the terms we need to communicate effectively. We also discover that the transformation of data to understanding is the critical requirement for Information Superiority. As we process, apply cognition, and judge data we also apply the qualities of relevance, accuracy, and timeliness. A walk up the Cognitive Hierarchy illustrates these relationships.

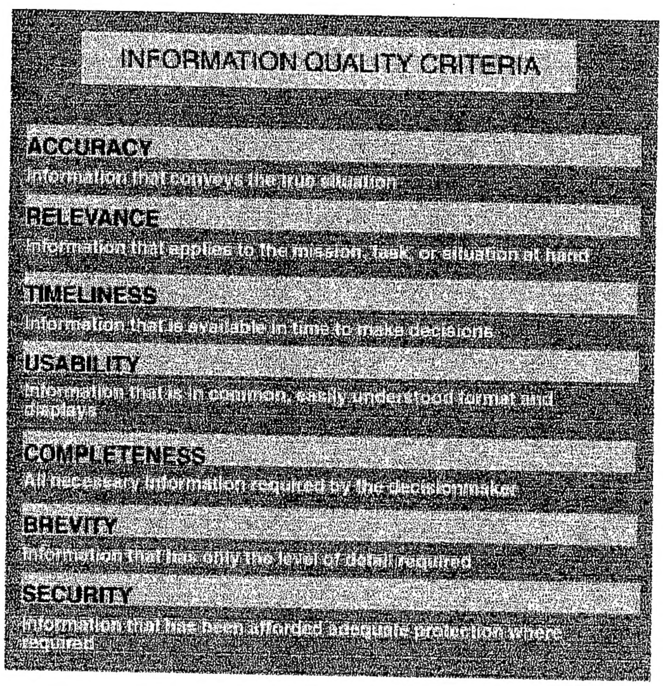

Figure 3: Information Quality Criteria

Doctrine defines data as: "any representations such as characters or analog quantities to which meaning is or might be assigned."[10] Doctrine defines "processing" as the act of transforming data into information. As a theoretical construct, we can also think of processing as applying the quality of *relevance* to data. At this level of transformation, we either eliminate extraneous data or fuse disparate data into useable information. It follows that information is defined as data collected from the environment and processed into a useable form.[11] Information *is* relevant data.

Information is transformed into knowledge through cognition. We can associate cognition with the quality criteria of *accuracy*. It is at this level of transformation that we gauge information as factual, validate it represents the true state of an object (or the environment) and assess if it is of the fidelity we require. When information meets this standard, knowledge is achieved. Doctrine defines knowledge as the combination of pieces of information with context.[12] Knowledge is accurate information.

Knowledge is transformed into understanding through judgment. In the military, it is at this level of transformation that knowledge is judged in terms of the space/time relationship of friendly forces compared to actions of the adversary. We can think of judgment as fulfilling the quality criteria of *timeliness*. When knowledge is applied in the context of our current or future situation, understanding is achieved.

When we combine the doctrinal framework of the Cognitive Hierarchy with these measures of quality, the relationship between decision making and information becomes clearer. Quality decisions are based on relevant, accurate, and timely data. Therefore decision making is dependent on the "Understanding" level of the Cognitive Hierarchy. This realization is most obvious for high-level, complex tasks such as situation development and operational planning. However, this construct is true at every echelon and for any task. For example, the tactical decision to engage a target such as a TEL follows the same model. A sensor receives data detecting an entity in the battlespace. The relevance transformation occurs when the entity fits the signature characteristics of a TEL. At this point processing occurs and the data becomes information. The accuracy transformation occurs if the information has enough fidelity to discriminate the TEL's identity from other battlespace entities (establish the information as factual) and the locational information meets targetable currency and positional accuracy. At

this point the original, relevant data may in and of itself contain the requisite accuracy, or it may need to be cross-cued or fused with other relevant data. In either case, cognition occurs and the information becomes knowledge. Accuracy transforms information into knowledge.

The timeliness transformation occurs if the commander's intent has identified TELs as high priority, immediate, targets and appropriate weapons systems are available to attack this target. The knowledge meets the criteria of timeliness. Judgment occurs. At this point, understanding is achieved and the result is a decision to engage the target.

This scenario demonstrates two points about Information Superiority. The first point supports the need for integrated networks variously described as Infostructures,[13] INFO Spheres,[14] or INFOSYS.[15] Networked sensor grids that allow the sharing of all elements in the cognitive hierarchy is a necessity. Data, information, knowledge, and understanding must all be transmitted over our networks. The TEL example above is optimized when the original data is available at numerous nodes in order to apply the quality measures needed to translate it into targetable understanding. Networking allows this to happen very quickly.

The second point the TEL scenario demonstrates is that the transition from data to understanding must occur in order to translate Information Superiority into increased combat power. Data in and of itself does not facilitate a decision. The jump from *data* disseminated over a sensor network to targetable *understanding* transmitted over an engagement network is not a given. A transformation must occur. If we look again at the lightning bolts on the futurists' viewgraphs, there is no graphic representation of where or how data morphs into understanding. This is a critical task that we tend to assume away when we imprecisely equate all forms of "information" as the same.

Our doctrine's Cognitive Hierarchy tells us we need to be precise in our categorization of "information". In a sense it describes the ingredients of the cloth we will weave for the Emperor's' clothes. Doctrine also shows us how the cloth needs to be tailored. When we apply this analogy to our capability to tailor data, we find that our current capacity to transform data to understanding is a critical weakness.

Capability-Based Assessment

When we realize that the transformation from data to understanding is an essential task, then it follows that we need to investigate this process. If the transformation process was seamless, then we could increase Information Superiority by simply adding more Intelligence, Surveillance, and Reconnaissance (ISR) sensors to our arsenal. It would be a linear relationship. More sensors equals more data, equals better understanding. This is a tempting solution because it is quantifiable. However, the transformation of data to understanding is not a seamless process. The seams are represented in what has recently been termed the TPED (Tasking, Processing, Exploitation, and Dissemination) architecture. The Processing and Exploitation elements of TPED are the relevant functions that transform data into understanding. An honest investigation of these elements reveals that we are already outstripping our ability to handle the data we receive from our current sensor suite. Unless we quantify our processing capability, we have no measure of effectiveness of our capability to exploit the data our sensors provide. Therefore, we have no measure of effectiveness of Information Superiority.

This insight is as important for today's operational war planner as it is for a futurist. A current planner should judge the potential of his ISR system by measuring not only the number of sensors in his task organization but also the processing capability in direct support of his

operation. A futurist must understand that visionary ISR architectures must include the adequate capability to process data into understanding.

There are two approaches to meeting this challenge. The first is a Simplistic Approach. The Simplistic Approach advocates future ISR assets with on board or automated cross-cueing and fusion capabilities. This approach assumes "thinking" sensors will transmit data that is inherently understandable. The second approach is a Capability-Based Approach. The Capability-Based approach uses current processing capabilities and procedures as a baseline to develop specific requirements for improvements.

The Simplistic Approach assumes that better ISR systems that collect more data will solve the problem. In this approach, the quality criteria of relevance, accuracy, and timeliness are achieved by an intelligent sensor suite. Many extrapolations of "sensor to shooter" solutions take this approach. The advocates of the Discoverer II Satellite Program and the Micro Unattended Ground Sensor Program advocate the utility of even more robust collection capabilities without outlining the corresponding requirement for processing and exploitation of the vast data to be collected.[16] Such simplistic approaches lead senior decision makers to make projections like the following prophesy by Admiral William Owens:

> ". . . early in the next century the United States will have the technical capability not only to locate and identify all major weapons systems and military vehicles on and above the surface of the earth in near real time, plus or minus 30 seconds time late, in all weather , all the time, in an area of roughly 40,000 square miles. We will also be able to relate those objects to each other in terms of their command and control relationships, to calculate what the capabilities of those weapons and platforms are given the terrain and other conditions in which they operate, and to associate them with historical operational patterns. We will be able to do this very quickly."[17]

The problem with the Simplistic Approach is that it requires a huge leap from current capabilities to achieve this end state. This is the point where visionaries lose disciples. The

Emperor is pretty threadbare. Investment in more and better collection systems that promise inherent processing capability is high risk. It is high risk because of potential stove piping or poor formatting of data received. We face the danger of fielding extravagant systems, with high data output, that do not efficiently contribute to increased battlefield understanding.

The second approach -- the Capability-Based Approach -- is less risky and has immediate *and* futuristic application. Serious study of the current constricting points in translating data to understanding, forces us to quantify our current operational capability,. For instance, if we know that a JSTARS Ground Station Module (GSM) can track 16 targets simultaneously, then we have an idea how many GSMs we need to support a given operation[18] This is an important planning factor for current operations. Simultaneously, this Capability-Based Approach allows us to define specific requirements for future ISR collection and processing systems. Rather than banking on significant leaps in smarter collection systems, we can shape change through iterative solutions. A reasonable transformation strategy will ensue.

The diverse, complex tasks required to translate data to understanding do not lend themselves to simplistic solutions. Three disciplines of intelligence illustrate the necessity for a Capability-Based Approach. Imagery intelligence (IMINT), Electronic intelligence (ELINT), and Communications intelligence (COMINT) are intelligence disciplines characterized by robust data collection capability and robust data dissemination architectures. In other words our current ISR systems for these disciplines have the ability to collect large volumes of raw data and transmit that data to a vast array of locations. However, this data must be transformed to be useable. ELINT analysts must tag redundant signals, type the radar emitters, and resolve locational ellipses. COMINT analysts must identify signals of interest, translate the intercepted message texts, and report significant results. IMINT analysts who work with photographic-type

images must identify physical features or enemy weapons systems, annotate photos, and mensurate targetable locational accuracy. IMINT analysts who work with moving target indicators must correlate moving targets' direction and speed of movement and report changes to baseline activity.

In each of the above cases the nature of the data is unique and the processing requirements demand specialized skills. ELINT data comes in a highly structured message format that is received and manipulated by an operator using a specific receiver and data processing system. At that workstation an ELINT analyst can transform data to understanding. He can identify which signals represent radars of interest (relevancy); reconcile signals to targeting accuracy (accuracy); and identify if the emitter type is time critical for targeting or current enough for situation development (timeliness).

COMINT data is an intercepted voice transmission. At a COMINT workstation the operator can transform data to understanding. He screens incoming transmissions in the target language for military related data (relevance); he determines if the information meets criteria for military utility or locational accuracy (accuracy); and identifies if it is time sensitive to the current operation (timeliness).

IMINT data from SLAR MTI or UAV video is received as a unique signal displayed on a video terminal. Like COMINT and ELINT operators, these IMINT workstations allow operators to translate data into understanding. The operator watches his video screen for unusual activity or military significant targets (relevance); identifies locational accuracy or resolves time/distance correlation for moving targets (accuracy); and determines if the activity represents current high value target criteria or is significant to update situation development (timeliness). IMINT data from photography-type sensors is received by a special workstation that allows manipulation of

the imaged area. Again, this is the location where data is transformed. The operator searches for, interprets, and labels military significant data (relevance); he mensurates targetable information (accuracy); and indicates the date-time-group of the image (timeliness).

It is important to understand that even sensor-to-shooter "data" updates require this transformation. Updated, in-flight targeting data to a smart munition must have met all three quality criteria of relevance, accuracy, and timeliness in order to be transmitted to the missile. Similarly, an updated image retransmitted to a pilot's cockpit must be confirmed as the right target, at the right place, at the current time. These are just two examples that show even very basic sensor-to-shooter tasks require the transformation of data to understanding.

The Simplistic Approach would lead us to believe that the data received at the various entry points described above can be processed by the sensor itself or fused through automatic correlation. Even the rudimentary examples I have used for ELINT, COMINT, and two types of IMINT demonstrate that these are extremely complex and diverse tasks. The Simplistic Approach of adding more robust and advanced sensors, without a corresponding strategy for processing, assumes away this challenge.

Careful reading of the quotation below from Kosovo/Operation Allied Force After Action Report to Congress illustrates this point.

> "For the United States, Operation Allied force provided a real-world test of information superiority concepts outlined in Joint Vision 2010. Over the course of Operation Allied Force, U.S. intelligence, surveillance, and reconnaissance capabilities provided unprecedented levels of *information* to NATO warfighters. The supporting intelligence architecture included a worldwide network of *processing* centers and high-speed data communications, all operating in direct support of combat operations in Kosovo. Despite NATO's success, it is evident that further *integration* of worldwide collection of intelligence, surveillance, and reconnaissance systems is needed to provide warfighters with a more *coherent* picture of the

battlespace and more *accurate, and timely* targeting support" [Emphasis added by author].[19]

The ISR assets in support of Kosovo provided a high volume of information but that volume had to be delegated to disparate processing centers worldwide. The need for further integration, coherence, accuracy, and timeliness demonstrate that this processing architecture did not satisfy the need to translate information (i.e. data) into understanding.

In fact, our processing capability is *the* restrictive element of our intelligence architecture. The man/machine interface at the initial processing sites creates a Venturi Effect for all data we collect. Increasing the number of sensors exacerbates the problem. A commander's quantifiable ability to "see the battlespace" is as dependent on the data transformation capability available to him as it is on his ISR collection capacity.

An example from the imagery assets supporting Task Force Hawk during Operation Allied Force gives us a current, concrete illustration. In direct support, Task Force Hawk had 10 imagery workstations, associated with 5 separate imagery collection systems. The Task Force's primary area of interest covered a doctrinal division-size maneuver area (defined by the Kosovo-Albanian border and the valley from Pec to Prizren).[20]

In order to visualize the relationship between these workstations, picture the JSTARS receiving moving target indicators (MTI) for all vehicles in the area of interest. The processing capability for the JSTARs MTI data consists of two operator positions in a Ground Station Module (GSM). In this deployment, the GSM was collocated with the Deep Operations Coordination Cell (DOCC) for Task Force Hawk. When the MTI present an indicator of unusual activity the GSM operators could request cross-cueing to obtain a radar-generated spot image by JSTARS, a radar-generated image by a U2, video from a Hunter UAV, or an image by

another collector. The same two GSM operators at TF Hawk DOCC receive the JSTARs radar-generated image to exploit. The U2 radar-generated image processing is done by 2 exploitation workstations in the Enhanced Tactical Radar Correlator (ETRAC) located in Brindisi, Italy. The photographic-type image processing capability is done by 3 workstations in the Modernized Imagery Exploitation System (MIES) located in Mainz-Finthen, Germany. The Hunter UAV video processing is done by a Ground Control Station (GCS) with two workstations collocated with the JSTARs GSM. In addition, the Task Force deployed a non-doctrinal imagery workstation which received national imagery from the Joint Warfare Analysis Center (JWAC) in CONUS.

Ten dispersed workstations associated with 5 different ISR systems can hardly produce the kind of battlefield awareness predicted by ADM Owens. In addition to a challenging dispersal of assets, consider that the team chief of a JSTARs GSM is a Sergeant First Class or Staff Sergeant (E-7 or E-6) and the operators are Private First Class through Sergeant (E-3 to E-5). Similarly, the operators of the MIES, ETRAC, and UAV GCS are Private First Class through Sergeant. These are all dedicated soldiers, but we need to ask if they have the experience and insight to translate data into understanding. With 10 workstations, the entire Task Force had 20-25 relatively junior personnel responsible for the transfer of imagery data to battlespace understanding.

In fact, with the exception of GSMs assigned to subordinate maneuver units, the imagery exploitation capability in direct support of TF Hawk represents all of the imagery exploitation workstations and personnel authorizations assigned to U.S. Army Europe. The news is not any better when we look at Army-wide assets. There is one Hunter UAV, three MIES, and two ETRACs in the entire Army.[21]

The Simplistic Approach leads us to conclude that all we need is more sensors with smart, onboard processing. At face value, the Capability-Based Approach could lead us to an equally simplistic conclusion that the answer lies in more TPED workstations and analysts. Neither of these conclusions is satisfying. To a certain extent, more is better for everything -- sensors, processors, and personnel. However, in resource-constrained reality, we only have a finite set of systems and personnel. The truly valuable answer we derive from a Capability-Based Approach is an accurate measure of effectiveness of the capacity we have now. From a solid assessment, we can realistically project affordable improvements that will provide us with the maximum effects.

We do this for all other military functions. We know how many sorties an aircraft carrier generates. We know the relative combat power of mechanized, armor, and infantry divisions. We know the logistics capacity of C-17s, fast supply ships, and material handling units. Similar to these functions, we need to know the capacity of our ISR and TPED system when we plan current operations and project future visions.

In order to intelligently plan support to today's operations and operations in the near future, we need current planning factors such as: How many target-packets per day can 1 imagery workstation crew produce? How many relocatable units (such as artillery and armor), within a given geographic footprint can 1 UAV track simultaneously? How many UAV GCSs are needed to support operational target tracking and target development for deep fires. How large a geographic area can U2 and JSTARs support situation development given different manning authorizations or processing architectures for ground stations? To what degree do these factors change between MOOTW and conventional conflict? To what degree do these factors change in desert versus mountainous versus urban terrain?

In order to harness tomorrow's technology explosion, we need to be able to compare different operational concepts and techniques today. We need to answer questions such as: How efficient is a federated architecture compared to an organic architecture? How do centralized command and control of ISR and TPED assets compare with the centralized collection and decentralized exploitation we have now? What functions need redundant exploitation assets because they occur simultaneously (e.g. target development, situation development, and BDA)?

Information Superiority will never completely lift Clausewitz's often-cited fog of war. Anything less than perfect battlespace understanding represents risk. Decision making is the process of leaders weighing risks against desired results. For that reason we cannot assume away the fog of war as we develop future warfighting concepts. We need answers to the questions posed above in order to quantify realistic capacities of given ISR/TPED configurations so we can accurately measure risk. The Capability-Based Approach tells the answers to these questions is not a rote count of collection platforms. The measure of effectiveness is dependent on the ability of a complex system to transform sensor data to battlespace understanding. So how do we quantify the capability of such a complex system? We find the answer the same way we have always done such evaluations. We conduct exercises.

Using Exercises to Measure Effectiveness

The military mantra for successful performance assessments has always been "train as you fight." In the ISR and TPED realm, this mantra can only be fulfilled in a joint environment. All of our recent military operations have depended on a multi-service confederation of ISR and TPED assets. An ideal exercise design would surgically insert raw data into a federated TPED architecture. Unfortunately the current constellation of JTF exercises use generic constellations of intelligence simulations such as the Army's Battle Command Training Program Intelligence

Capabilities Model (BICM) and the Air Force's Joint Operations Information Simulation (JOISIM).[22] These "intelligence drivers" do not replicate the dynamics between data collection and processing because they simulate the majority of the processing functions in order to minimize the need for fully staffed intelligence cells to drive the other objectives of exercises.

However, there is another intelligence simulation, Tactical Simulation, (TACSIM) which has the potential to meet this challenge. The technology, simulation, and scenarios to measure our capability to exploit collected data is resident in this exercise driver. TACSIM is designed to provide intelligence analysts with realistic emission and signature profiles for ground forces. Ground force scenarios represent a good test of JTF intelligence architectures because the target sets and situation development tasks are complex. Additionally they are common to the Air Force's air interdiction and close air support missions, and the Navy's Forward from the Sea and the Marine's force projection concepts.

TACSIM provides a realistic portrayal of data that our ISR sensors would produce. Communication signatures, electronic signatures, and imagery profiles are developed by the TACSIM project office based on criteria developed by the National Ground Intelligence Center.[23] Additionally there is a JSTARs and UAV simulator associated with the TACSIM system. Secondary imagery dissemination can also be replicated with an additional application to the basic simulation. With, TACSIM, the capability to quantify our ability to transform large volumes of data into battlefield understanding is already part of DOD's arsenal of training tools.

The Army has had TACSIM exercise capability for several years, but we have not fully used it as a source of experimentation to measure ISR data exploitation proficiency. The reason we have marginalized this tool is a function of the exercise scenarios in which it is most often used. The TACSIM driver is most often used as part of the Army's Battle Command Training

Program (BCTP). The focus of the BCTP exercises is to develop the command and control mechanisms of Division and Corps battle staffs. As a result, some of the potential intelligence training capabilities are sub optimized in order to ensure the exercise stresses all the Battlefield Operation Systems.

Fortunately, the Army's BCTP exercise design has graduated beyond a service-specific focus. The BCTP exercise program has a dedicated team to evaluate exercises in which Army headquarters act as Joint Task Force (JTF) headquarters. The structure to use this exercise design for JTF ISR/TPED evaluations is in place. Similarly the TACSIM intelligence driver is a resident module at the National Simulation Center. Both the exercise design and intelligence simulation tools are available to the joint community.

We can accomplish an intelligence-only exercise in a JTF scenario. TACSIM can simulate ISR collection data and disseminate it to an entire federation of processors assigned to a JTF. For instance, U2 ASARS data would go to a U2 processing facility. JSTARS and UAV simulations would run at the JSTARS GSM and UAV GCS sites respectively. Sensor data would enter the tested architecture as it would during real world operations. Similar data insertion techniques are available for SIGINT and HUMINT.[24] We would have a true test of our ability to translate data to understanding in a given architecture.

In this controlled environment, we could establish hard data about the true processing capability of any particular intelligence system. For example we could validate: the number of targets one GSM can simultaneously track for targeting accuracy, the number of targetable ELINT reports generated by an Advanced Electronic Processing and Dissemination System, or the best ISR suite to support a JSEAD operation. We could experiment with different

architectures, doctrines, and procedures in order to judge the most efficient organizational constructs. The results would define requirements for futuristic improvements and initiatives.

I fully understand this exercise concept adds to the already full exercise and operational tempo of all units. However, we need to remember the construct of JV 2010 establishes Information Superiority as an enabler for all four Operational Concepts. Currently, we train and exercise the Concepts but make assumptions about this enabler. Since Information Superiority is fundamentally important to the success of the Concepts, it deserves better evaluation. Quantifiable experimentation is needed in order to keep us on the right vector to sustain Information Superiority. Technology promises us unimaginable opportunities to sense the battlespace of the future, it is essential that we have a solid exercise program that insures we exploit those opportunities wisely.

There is an opportunity here for the kind of successful inter-war testing, experimentation, and training that the Army conducted during its famous Louisiana Maneuvers and the Navy conducted during its War College planning for war in the Pacific. I believe the mission of Joint Forces Command was created for the type of exercise and experimental testing that I have described above. They are the only organization that has the charter, focus, and forces to carry out such a plan.

Conclusion

The senior leadership of our military presented us with exciting and challenging visions of future military capabilities. The unknown potential of technological change and the explosion of the information environment inspired many wise futurists to describe various warfighting revolutions. We are at the beginning of a journey that will either see those predictions met, exceeded, or fail. As we tackle the challenge of Information Superiority, we need to ensure we

are not hypnotized by the promise of quantum leaps in capability simply because they seem attractive.

Reality-based transformation and innovation can occur if we keep certain touchstones in mind. First, we need to make sure we communicate using a mutually understood frame of reference. Doctrine does that for us by defining terms and concepts. Second, even revolutionary change starts from where we stand. We can achieve successful leaps in capability as long as we are sure we do not assume away needed solutions to hard problems. An evaluation of our current capabilities shows us the toughest problem we face is our limited ability to transform data into battlefield understanding. Third, we need to test and quantify where we are and evaluate how we can maximize revolutionary technology with solid operational concepts. The military has long used exercises to accomplish this mission. We have the capability to apply this same tool to our new challenge.

The Emperor waited too long before the little boy gave him his reality check. We can avoid the Emperor's embarrassment if we use these touchstones as we make Information Superiority an enabler for a worthy vision.

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[1] U.S. Joint Chiefs of Staff, Department of Defense Dictionary of Military and Associated Terms (Joint Pub 1-02) (Washington, D.C.: April 15, 1999), 217.

[2] David Alberts, John Garstka, and Frederick Stein, Network Centric Warfare: Developing and Leveraging Information Superiority (Washington, D.C.: 1999), 247.

[3] Randall Stross, "Silicon Valley Killjoy: A Technologist Warns of the Dark Side of Progress," U.S. News & World Report, 3 April 2000, 22.

[4] U.S. Joint Chiefs of Staff, Doctrine for Command Control, Communications, and Computer (C4) Systems Support to Joint Operations (Joint Pub 6-0) (Washington, D.C.: May 30, 1995), I-4.

[5] Department of the Army, Field Manual 100-6 Information Operations (Washington, D.C.: August 27, 1996), 2-1.

[6] U.S. Joint Chiefs of Staff, Joint Pub 6-0 , I-4.

[7] Department of the Army, Field Manual 100-6 , 2-1.

[8] U.S. Joint Chiefs of Staff, Joint Pub 6-0, I-5.

[9] Alberts and Garstka, 34.

[10] U.S. Joint Chiefs of Staff, Joint Pub 1-02, 120.

[11] U.S. Joint Chiefs of Staff, Joint Pub 6-0 , I-3 .

[12] Ibid.

[13] Alberts and Garstka, 35.

[14] U.S. Joint Chiefs of Staff, Joint Pub 6-0, I-12.

[15] Department of the Army, Field Manual 100-6 , 5-0.

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[17] ADM William Owens, "Intelligence in the 21st Century", Defense Intelligence Journal, Spring 1998, 45.

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[19] Department of Defense, Report to Congress: Kosovo/Operation Allied Force After Action Report, (Washington: 2000), xxii.

[20] Hector Cuevas, "Collection and Management and Imagery Support to Deep Operations in Kosovo," Military Intelligence Professional Bulletin , January - March 2000, 17.

[21] Army Space Program Office, Army TENCAP into the 21st Century.... Bringing Space to Ground Maneuver, (Washington: 1995), 42.

[22] Mr. Dave Guerrero, Project Manager, TACSIM Project Office, telephone conversation with the author, 12 May 2000.

[23] Major Karen Tomlin, Director, TACSIM Project Office, telephone conversation with author, 8 May 2000.

[24] Dave Guerrero, <Guerro@tacintel.com> "TACSIM Brief, T3 BRIEF - User's Conf, Jan 00.ppt", 12 May 2000, (12 May 2000).

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APPENDIX A
TACSIM Capabilities Briefing

TACSIM

T3

2.1.5.4.3

MISSION

Provide simulated intelligence collection and reporting through user organic communications and processors to provide training for intelligence analysts, collection managers, and staffs.

Support development of IEW equipment

CAPABILITIES

TRAIN INTEL MANAGERS AND ANALYSTS

HI-FIDELITY SIMULATED DATA:
- TECHNICAL PARAMETERS
- SIGNAL ENVIRONMENT
- IMAGERY REPRESENTATIONS
- TERRAIN OBSCURATION/WEATHER

TRAIN BATTLE COMMAND AND STAFF

GENERAL INTEL DATA (RED AND BLUE):
- SITUATION REPORTS
- SALUTE REPORTS

CAPABILITIES

DISTRIBUTED SIMULATIONS (TASKING - PRODUCTS - AAR)

REAL WORLD C4I ARCHITECTURE

DYNAMIC INTERACTIVE SENSORS

BATTLEFIELD VISUALIZATION (OBJECT REPRESENTATION) & TEXT MESSAGE CAPABILITIES

CAPABILITIES

CONFEDERATION AND STAND-ALONE TRAINING CAPABILITY

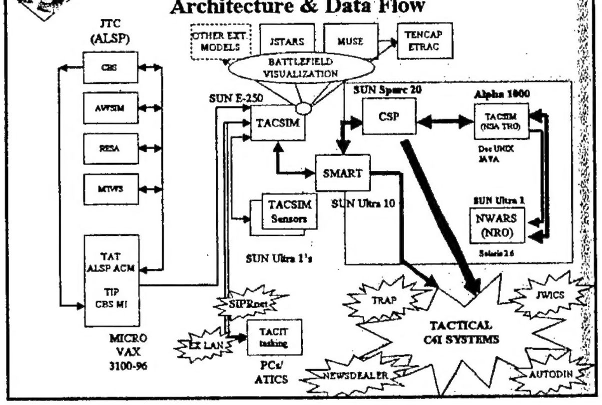
SCI - UNCLASSIFIED CAPABILITY (MULTI-LEVEL, MULTI-NATIONAL)

AUTOMATED DATABASE PREPARATION

OVER 30 ACCREDITED C4I INTERFACES

RED ON BLUE INTEL CAPABILITY

TACSIM Architecture & Data Flow



AUTOMATIC DATABASE PREPARATION

Auto creates intelligence data base from JTC/CBS Scenario Initialization Files (SIF)

Hi-fidelity data includes networks, radio/radar parametrics, emitter and transmission policies, NIIRS and NRIS data, and doctrinally correct unit/equipment deploys

AUTOMATIC DATABASE PREPARATION

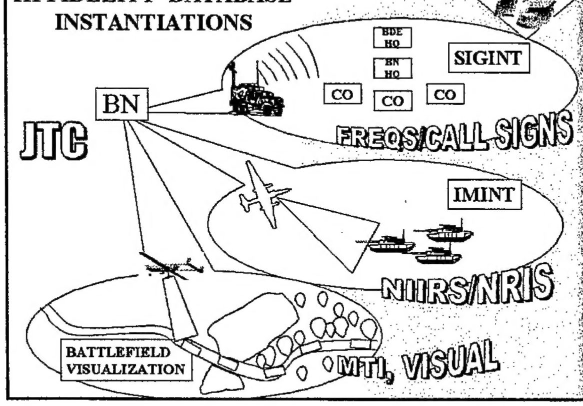
Based on National Ground Intelligence Center (NGIC) approved data

Delivered with MRC-E, MRC-W, and Generic data bases

Smart software tools for inputting changes (e.g., drag and drop icons)

Maximum user flexibility

HI FIDELITY DATABASE INSTANTIATIONS



TACSIM INTELLIGENT TERMINAL (TACIT)

Distributed Capability "Tasking from the TOC"

Interactive "smart" sensor status

Intuitive GUI, minimal training required

Map Vision graphical display

Display AAR queries using Map Vision

TACSIM INTELLIGENT TERMINAL (TACIT)

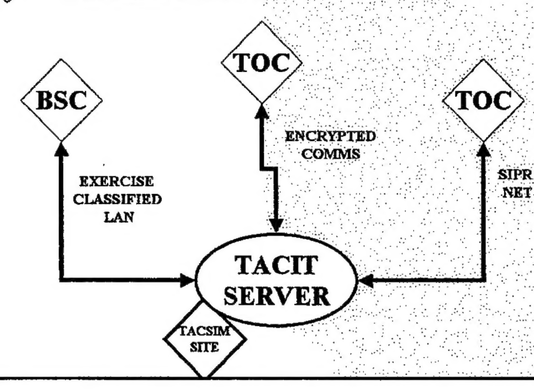
Smart user friendly tools for tasking (selectable coordinate version , graphical route/ location plotting, etc)

Sensor Reference data base

"Real Time" view of Collection Plan

Supports interface with JCMT

TACIT DISTRIBUTED CONNECTIVITY



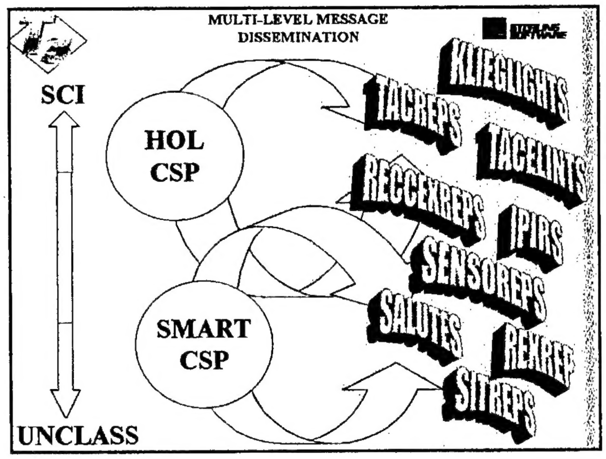
MULTI-LEVEL / MULTI-NATIONAL SECURITY ACCREDITATION

SCI through Unclassified security operations

Accredited for communicating with over 30 C4I systems

Multi-National dissemination, NATO (LOCE), ROK (PASS-K)

All Source code is unclassified, Data is collateral



MULTIPLE TRAINING OPTIONS

Federation

- **Receive Battlespace information from other models**
- **Supports multi-service training requirements**

Stand-alone

- **T3 controls Battlespace**
- **Intelligence training "drives" simulation**

FULL SPECTRUM OF INTELLIGENCE OPERATIONS

Requires "Intel Process" to obtain timely and relevant information

Full complement of intelligence capabilities from National through Division (MI BN) level

Requires "real world" processors and communications capabilities

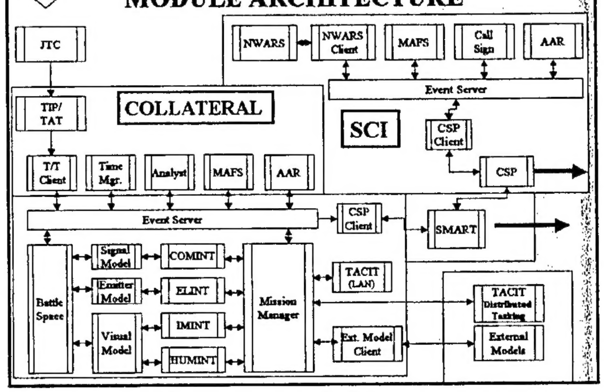
"TRAIN AS YOU FIGHT"

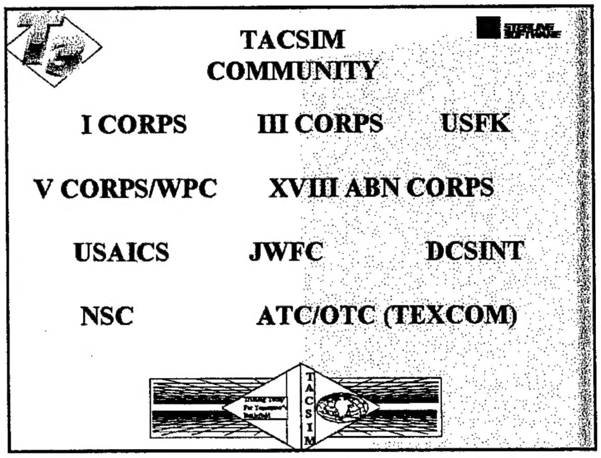
SENSOR SUITES

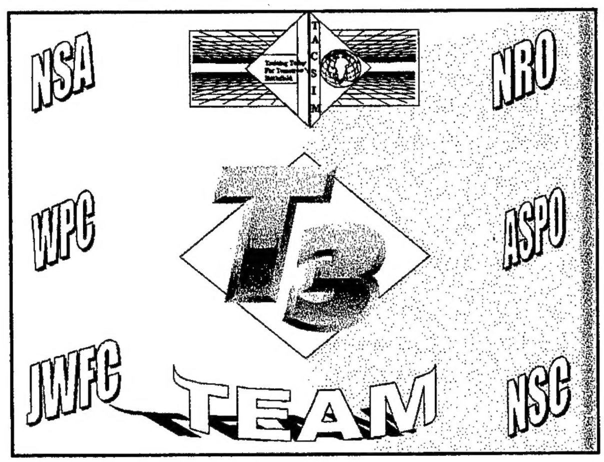
COMINT	ELINT	IMINT	HUMINT
GUARDRAIL CS	GUARDRAIL CS	U2 HCAMERA	CI/HUMINT*
U2 SENIOR SPEAR	U2 SENIOR RUBY	U2 ASARS	EPW
RC135 RIVET JOINT	RC135 RIVET JOINT	U2 SYERS	LINE CROS
TRQ32 TEAMMATE	EA6B PROWLER	HUNTER	REFUGEES
TLQ17A TRAF JAM	ARL	ARL	DOCEX
ARL	GENERIC	F14 TARPS	LRS/SOF
PRD10/11/12	NATIONAL	JSTARS	NATIONAL
ETRACKWOLF		GENERIC	
TSQ138 TRAIL BLZ		NATIONAL	
QUICKFIX II			
GENERIC			

* Collaboration with Ft Huachuca

T3 MODULE ARCHITECTURE




TACSIM
COMMUNITY
I CORPS
III CORPS
USFK
V CORPS/WPC
XVIII ABN CORPS
USAICS
JWFC
DCSINT
NSC
ATC/OTC (TEXCOM)
TACSIM


NSA
TACSIM
NRO
WPC
ASPO
JWFC
TEAM
NSC